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Remarks

Reconsideration of the above-captioned application is respectfully requested. Non-elected claims 25-37 have been canceled, as have claims 9 and 10. The informality noted in Claim 11 has been cured herein and will not be further addressed. Various dependent claims have been amended to improve their recitations. Also, new Claims 38 and 29 have been added, support for which may be found, e.g., in the abstract and in paragraphs 129-134 of the published version of the application.

Additionally, Claim 1 has been amended considerably to clarify that fingerprint images are enhanced on a sub region basis by classifying sub regions and for each classified sub region convolving it with a filter that has been previously derived through an expert learning process to obtain transformed sub regions and, hence, an enhanced image of the fingerprint. Claim 24 has been amended to further specify that the filters are derived using a least squares fit. Claims 1-8, 11-24, 38, and 39 are pending.

Claims 1-9, 11, 12, 13, and 16-24 have been rejected under 35 U.S.C. §103 as being unpatentable over Montillo et al., USPN 6,647,132 which admittedly fails to teach using a learning process to develop filters, in view of Clarke et al., USPN 5,825,936, used as a teaching of using a learning process to develop filters. Claim 10, which formerly recited fingerprints, has been rejected as being unpatentable over the two references above in view of Chang et al. USPN 5,572,597.

Neither of the first two references mentions fingerprints, the subject of amended Claim 1. Further, Clarke et al.'s teaching is directed to enhancing the images of mammograms. While the reference states that it can be applied to nameless "other" images, the fact is that fingerprint images, never contemplated by Clarke et al., have peculiarities as noted in the present background. Thus, simply noting that a tertiary reference seeks to enhance fingerprints (a reference that is merely cumulative to those already noted in the present

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background) does not motivate the artisan to use any particular image enhancement method when the method itself never indicates that it might be useful in the peculiar context of fingerprints. Note that the mere fact that a reference can be modified does not render an invention obvious, unless the modification is suggested by the prior art, In re Mills, MPEP §2143.01; a generic comment does not suggest a specific solution because obviousness cannot be predicated on what is not taught, In re Rijckaert, 9 F.3d 1531 (Fed. Cir. 1993).

In the present case, there is no suggestion that the alleged "learning process" of the secondary reference ought to be applied in the particular now set forth in Claim 1, namely, by obtaining a representative set of fingerprints and establishing, using a human or machine expert, a corresponding set of desired maps, with a set of filters being developed therefrom. Chang et al. does not appear to address expert learning at all, so it cannot suggest how, precisely, Clarke et al. might be modified to use the idea in the context of fingerprints, a concept never considered by Clarke et al., much less still does a suggestion exist as to how, precisely, one might drop the modified version of Clarke et al., which never discusses fingerprints, into Montillo et al., which likewise never discusses fingerprints or for that matter mammograms but rather machine vision technology.

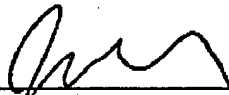
As taught in the present specification but not the prior art, the invention is indeed "a new approach to fingerprint enhancement" using a set of adaptive enhancement filters that are learned off-line, and then achieving on-line enhancement by convolving the sensed image, sub region by sub region, with appropriate filters. As recognized by the present invention as reflected in Claim 1 but not in the applied references, a single enhancement filter cannot give good performance over a large number of sensed fingerprints, because estimation such as least square estimation is susceptible to outliers. To reduce the error, the sensed fingerprint space is partitioned and a filter for each partition is generated.

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